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CONCERNING A FILING UNDER 35 U.S.C. 371

U.S. APPLICATION NO. (IF KNOWN, SEE 37 CFR

09/446888

INTERNATIONAL APPLICATION NO
PCT/JP99/02370INTERNATIONAL FILING DATE
May 7, 1999PRIORITY DATE CLAIMED
May 7, 1998

TITLE OF INVENTION

SPREADING SIGNAL ASSIGNING METHOD AND SIGNAL TRANSMITTING METHOD IN DIRECT
SEQUENCE CDMA MOBILE COMMUNICATION SYSTEM, MOBILE WIRELESS COMMUNICATION.....

APPLICANT(S) FOR DO/EO/US

Toshiyuki FUTAKATA, et al.

Applicant herewith submits to the United States Designated/Elected Office (DO/EO/US) the following items and other information:

1. ☒ This is a **FIRST** submission of items concerning a filing under 35 U.S.C. 371.
2. ☐ This is a **SECOND** or **SUBSEQUENT** submission of items concerning a filing under 35 U.S.C. 371.
3. ☒ This is an express request to begin national examination procedures (35 U.S.C. 371(f)) at any time rather than delay examination until the expiration of the applicable time limit set in 35 U.S.C. 371(b) and PCT Articles 22 and 39(1).
4. ☐ A proper Demand for International Preliminary Examination was made by the 19th month from the earliest claimed priority date.
5. ☒ A copy of the International Application as filed (35 U.S.C. 371 (c) (2))
 - a. ☐ is transmitted herewith (required only if not transmitted by the International Bureau).
 - b. ☒ has been transmitted by the International Bureau.
 - c. ☐ is not required, as the application was filed in the United States Receiving Office (RO/US).
6. ☒ A translation of the International Application into English (35 U.S.C. 371(c)(2)).
7. ☒ A copy of the International Search Report (PCT/ISA/210).
8. ☒ Amendments to the claims of the International Application under PCT Article 19 (35 U.S.C. 371 (c)(3))
 - a. ☐ are transmitted herewith (required only if not transmitted by the International Bureau).
 - b. ☐ have been transmitted by the International Bureau.
 - c. ☐ have not been made; however, the time limit for making such amendments has NOT expired.
 - d. ☒ have not been made and will not be made.
9. ☐ A translation of the amendments to the claims under PCT Article 19 (35 U.S.C. 371(c)(3)).
10. ☒ An oath or declaration of the inventor(s) (35 U.S.C. 371 (c)(4)).
11. ☐ A copy of the International Preliminary Examination Report (PCT/IPEA/409).
12. ☐ A translation of the annexes to the International Preliminary Examination Report under PCT Article 36 (35 U.S.C. 371 (c)(5)).

Items 13 to 18 below concern document(s) or information included:

13. ☒ An Information Disclosure Statement under 37 CFR 1.97 and 1.98.
14. ☐ An assignment document for recording. A separate cover sheet in compliance with 37 CFR 3.28 and 3.31 is included.
15. ☐ A **FIRST** preliminary amendment.
A **SECOND** or **SUBSEQUENT** preliminary amendment.
16. ☐ A substitute specification.
17. ☐ A change of power of attorney and/or address letter.
18. ☐ Certificate of Mailing by Express Mail
19. ☒ Other items or information:

Notice of Priority
Form 1449
Drawings (10 sheets)

U.S. APPLICATION NO. (IF KNOWN, SEE 37 CFR 1.492(a)(1)-(5)) : <div style="font-size: 1.5em; font-weight: bold; margin-top: 5px;">097/446888</div>		INTERNATIONAL APPLICATION NO <div style="font-weight: bold; margin-top: 5px;">PCT/JP99/02370</div>		ATTORNEY'S DOCKET NUMBER <div style="font-weight: bold; margin-top: 5px;">6342-0039-2 PCT</div>	
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20. The following fees are submitted: BASIC NATIONAL FEE (37 CFR 1.492 (a) (1) - (5)) : <div style="display: flex; justify-content: space-between;"> <div style="width: 80%;"> <input checked="" type="checkbox"/> Search Report has been prepared by the EPO or JPO <input type="checkbox"/> International preliminary examination fee paid to USPTO (37 CFR 1.482) <input type="checkbox"/> No international preliminary examination fee paid to USPTO (37 CFR 1.482) but international search fee paid to USPTO (37 CFR 1.445(a)(2)) <input type="checkbox"/> Neither international preliminary examination fee (37 CFR 1.482) nor international search fee (37 CFR 1.445(a)(2) paid to USPTO <input type="checkbox"/> International preliminary examination fee paid to USPTO (37 CFR 1.482) and all claims satisfied provisions of PCT Article 33(2)-(4) </div> <div style="width: 15%; text-align: right; vertical-align: top;"> <div style="margin-bottom: 5px;">\$840.00</div> <div style="margin-bottom: 5px;">\$670.00</div> <div style="margin-bottom: 5px;">\$760.00</div> <div style="margin-bottom: 5px;">\$970.00</div> <div style="margin-bottom: 5px;">\$96.00</div> </div> </div>				CALCULATIONS PTO USE ONLY <div style="border: 1px solid black; height: 100px; margin-top: 5px;"></div>	
ENTER APPROPRIATE BASIC FEE AMOUNT =				\$840.00	
Surcharge of \$130.00 for furnishing the oath or declaration later than <input type="checkbox"/> 20 <input type="checkbox"/> 30 months from the earliest claimed priority date (37 CFR 1.492 (e)).				\$0.00	
CLAIMS	NUMBER FILED	NUMBER EXTRA	RATE		
Total claims	9 - 20 =	0	x \$17.00	\$0.00	
Independent claims	6 - 3 =	3	x \$78.00	\$234.00	
Multiple Dependent Claims (check if applicable).				\$0.00	
TOTAL OF ABOVE CALCULATIONS =				\$1,074.00	
Reduction of 1/2 for filing by small entity, if applicable. Verified Small Entity Statement must also be filed (Note 37 CFR 1.9, 1.27, 1.28) (check if applicable).				\$0.00	
SUBTOTAL =				\$1,074.00	
Processing fee of \$130.00 for furnishing the English translation later than <input type="checkbox"/> 20 <input type="checkbox"/> 30 months from the earliest claimed priority date (37 CFR 1.492 (f)).				\$0.00	
TOTAL NATIONAL FEE =				\$1,074.00	
Fee for recording the enclosed assignment (37 CFR 1.21(h)). The assignment must be accompanied by an appropriate cover sheet (37 CFR 3.28, 3.31) (check if applicable).				\$0.00	
TOTAL FEES ENCLOSED =				\$1,074.00	
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☒ A check in the amount of **\$1,074.00**

to cover the above fees is enclosed.

☐ Please charge my Deposit Account No. _____ in the amount of _____ to cover the above fees.
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NOTE: Where an appropriate time limit under 37 CFR 1.494 or 1.495 has not been met, a petition to revive (37 CFR 1.137(a) or (b)) must be filed and granted to restore the application to pending status.

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 December 30, 1999
 DATE

SPECIFICATION

TITLE OF THE INVENTION

SPREADING SIGNAL ASSIGNING METHOD AND
SIGNAL TRANSMITTING METHOD IN DIRECT SEQUENCE CDMA
5 MOBILE COMMUNICATION SYSTEM, MOBILE WIRELESS
COMMUNICATION SYSTEM USING THE METHODS, AND
TRANSMITTER, RECEIVER AND TRANSCEIVER IN THE MOBILE
WIRELESS COMMUNICATION SYSTEM

10 TECHNICAL FIELD

The present invention generally relates to
a spreading signal assigning method and a signal
transmitting method in a direct sequence CDMA (Code
Division Multiple Access) mobile communication
15 system which performs a multiple access by using a
direct sequence method, and relates to a mobile
wireless communication system using the methods, and
a transmitter, a receiver and a transceiver in the
mobile wireless communication system.

20

BACKGROUND ART

Generally, in a direct sequence CDMA
system, a first spreading code group common to base
stations which have the same repetition period as
25 that of an information symbol period (hereinafter, a
code which has the same repetition period as the
information symbol period will be called a short
code) and a second spreading code group which has a
longer repetition period than the information symbol
30 period (hereinafter, a code which has a longer
repetition period than the information symbol period
will be called a long code) are used. A signal is
transmitted by spreading doubly with a first
spreading code of the first spreading code group and
35 a second spreading code of the second spreading code
group (here, the second spreading code varies from
one base station to another). The second spreading

code is used in order to reduce interference from other base stations since the number of first spreading code of the first spreading code group is limited.

5 Fig.1 shows a configuration example of the direct sequence system used in general. In the system, received information is first-spread with a first spreading code. After that, the received
10 information is second-spread with a second spreading code. Information which is applied to an input terminal 1 is first-spread in a multiplier 2 by multiplying the information by an output from a first spreading code generator 3. Next, a spreading
15 output from the multiplier 2 is multiplied by an output from a second spreading code generator 5 such that second-spread is performed and a spreading modulation signal output is obtained at an output terminal 6.

 Fig.2 shows another configuration example.
20 According to the configuration, the received information is spread by performing an exclusive OR operation on the first spreading code and the second spreading code. A result of an exclusive OR operation of an output from the first spreading code
25 generator 3 and an output from the second spreading code generator 5 is calculated by an exclusive OR circuit 9. Information received at the input terminal 1 is calculated using the result of the exclusive OR operation in a multiplier 8 such that
30 the spreading modulation signal output is obtained at the output terminal 6.

 Here, an orthogonal code (for example, a GOLD code) is used as the first spreading code generally. The number of the orthogonal codes which
35 are generated is limited to the number of a spreading ratio. Therefore, in a general direct sequence CDMA communication system, a signal is

spread and transmitted with the second spreading code having a longer repetition period than the information symbol period as well as the first spreading code having a repetition period of the
5 information symbol period. The second spreading code having the longer repetition period can have a large number of spreading codes by highly increasing the repetition period.

Fig.3 shows a configuration example of a
10 receiver where a signal is transmitted after being spread doubly with a first spreading code and a second spreading code.

A signal which is doubly spread with the first spreading code and the second spreading code
15 is received by an antenna part 10 and received by an RF receive part 11. The received signal is multiplied by an output from a second spreading code generator 13 in a multiplier 12 such that the received signal is first-despread. Next, an output
20 from the multiplier 12 which is despread is multiplied by an output from a first spreading code generator 15 in a multiplier 14 such that it is second-despread, and then an output from the multiplier 14 is applied to a demodulator 16. After
25 that, demodulated data is obtained from the demodulator 16.

Instead of despreding by using the multiplier 12 and the multiplier 14 with the second spreading code and the first spreading code,
30 respectively, despreding can be carried out by using a multiplier with a result of an EXOR operation on the first spreading code and the second spreading code as shown in Fig.2.

Fig.4 shows a configuration example of a
35 transmitter where a signal is spread doubly with a first spreading code and a second spreading code, and is sent.

Data to be transmitted is applied to a modulator 21. An output from the modulator 21 is multiplied by an output from the first spreading code generator 23 such that it is first-spread.

5 Next, an output from a multiplier 22 which is spread is multiplied by an output from a second spreading code generator 25 in a multiplier 24 such that it is second-spread. Then, it is applied to an RF transmitter 26. An output from the RF transmitter
10 26 is output from an antenna part 20.

Instead of despreading by the multiplier 22 and the multiplier 24 with the first spreading code and the second spreading code, despreading can be carried out by using a multiplier with a result
15 of an EXOR operation on the first spreading code and the second spreading code as shown in Fig.2.

By the way, in a wireless mobile communication system, a mobile station communicates with a telephone terminal in a public network or the like via a wireless base station. A wireless
20 circuit can be easily listened in on or used fraudulently since the circuit is open to the air. Hence, there have been various technologies conventionally which enable a mobile station to
25 connect to only a specific base station in order to avoid others listening in or a fraudulent use.

For example, Japanese laid-open patent application No.63-189026 discloses an invention of a cordless telephone system such as a normal domestic
30 cordless telephone. In the cordless telephone, a cordless handset and a cordless base transmit/receive a unique system identifying number (which is configured by a fixed identifying number which is assigned to the cordless base and the
35 cordless handset and a plurality of identifying numbers which determine an order) such that a cordless base which can communicate with a cordless

handset is identified. Communication is allowed only when the system identifying number of the cordless base matches with the system identifying number of the cordless handset.

5 As another example, Japanese laid-open patent application No.7-203540 discloses an invention regarding a business cordless telephone system which provides a roaming service for a terminal which moves in a wireless service area of a
10 PBX. In the conventional example, a cordless handset stores a plurality of unique system identifying numbers (base station IDs) which are assigned to each system which numbers can be communicated, or the cordless handset stores a
15 network identifying number (network ID) which indicates a plurality of system identifying numbers which can be communicated by the cordless handset. When communicating, the cordless handset identifies a cordless base which can communicate with the
20 cordless handset by transmitting/receiving the identifying numbers. That is, when the system identifying numbers or the network identifying numbers of the cordless handset and the cordless base are the same, the cordless handset and the
25 cordless base can communicate with each other.

Fig.5 shows an example of a generalized configuration for a roaming service between PBXs (private branch exchanges). When a mobile terminal apparatus 43 moves from a zone of the PBX A 41 to a
30 zone of the PBX B 42, the system identifying number or the network identifying number is checked so as to determine whether the roaming service is provided.

Generally, a control for determining whether a base station and a mobile station are
35 allowed to connect should be carried out as quickly as possible, since the control is a preparation.

By the way, if the inventions disclosed in

the above-mentioned Japanese laid-open patent application No.63-189026 and Japanese laid-open patent application No.7-203540 are applied as is to the direct sequence CDMA mobile communication system, the mobile station needs to receive and recognize the system identifying number or the network identifying number. For that purpose, the mobile station needs to know a spreading code (a long code or a short code) which the base station uses. After despreading a received signal with the spreading code, the mobile station can know the system identifying number or the network identifying number from an information symbol. In this case, if the spreading code is not known beforehand, it is necessary to identify the spreading code. Therefore, it takes much time for the mobile station to determine whether the mobile station can connect to the base station from the received signal. Thus, the above-mentioned method is not practical.

DISCLOSURE OF THE INVENTION

On the other hand, in the direct sequence CDMA mobile communication system, a different second spreading code, which is a different long code, for each base station is used. However, when the direct sequence CDMA mobile communication system is applied to a small mobile communication system such as a cordless telephone system and the like, the different second spreading code is not necessarily required for each base station.

The present invention is achieved in view of the above-mentioned finding that the different second spreading code is not necessarily required for each base station and the above-mentioned problems. An objective of the present invention is to provide a spreading signal assigning method and a signal transmitting method in the direct sequence

CDMA mobile communication system, a mobile wireless communication system, and a transmitter, a receiver and a transceiver in the mobile wireless communication system, in which an assignment method
5 of the second spreading code is devised such that interference between cordless systems can be avoided and a roaming service can be provided.

The invention described in claim 1 is a spreading code assigning method in a direct sequence
10 CDMA mobile communication system for transmitting a signal after spreading the signal doubly with a first spreading code in a first spreading code group and a second spreading code in a second spreading code group, the first spreading code having the same
15 repetition period as an information symbol period, the second spreading code having a longer repetition period than the information symbol period, the first spreading code and the second spreading code forming spreading codes for enlarging a band of a wide-band
20 signal, a rate of the spreading codes being higher than an information rate, the method comprising the step of:

assigning a code associated with each base station group or a code associated with each network
25 type to which the base station group belongs as the second spreading code.

According to the spreading code assigning method, by assigning a code associated with each base station group or a code associated with each
30 network type to which the base station group belongs as the second spreading code, various services can be provided by using the second spreading code.

For example, by assigning a code associated with each network type and verifying the
35 second spreading code between a base station and a mobile station, a roaming service becomes possible.

In addition, by assigning a code

associated with each base station group or a code associated with each network type to which the base station group belongs by carrier, geographic area, floor level of a building, company, special service
5 or the like, various services in a small area, a midsize area, a wide area, an indoor area, an outdoor area or the like become possible.

The invention described in claim 2 is a signal transmitting method in a direct sequence CDMA
10 mobile communication system for transmitting a signal after spreading the signal doubly with a first spreading code in a first spreading code group and a second spreading code in a second spreading code group, the first spreading code having the same
15 repetition period as an information symbol period, the second spreading code having a longer repetition period than the information symbol period, the first spreading code and the second spreading code forming spreading codes for enlarging a band of a wide-band
20 signal, a rate of the spreading codes being higher than an information rate, the method comprising the steps of:

assigning a code associated with each base station group or a code associated with each network
25 type to which the base station group belongs as the second spreading code; and

transmitting a signal which is spread with the second spreading code between a base station and a mobile station.

30 According to the signal transmitting method, by assigning a code associated with each base station group or a code associated with each network type to which the base station group belongs as the second spreading code, and by transmitting a
35 signal spread by the second spreading code, since a spreading code in itself functions as an identifying number of a cordless telephone system, the cordless

handset does not need to check the identifying number of the cordless telephone system after identifying a spreading code for despreading. Thus, the cordless handset can identify easily a cordless
5 base with which the cordless handset can communicate. In addition, the cordless handset can not communicate with a cordless base of an other cordless telephone system. Therefore, interference from other cordless telephone systems can be avoided.

10 Further, a roaming service and the like becomes possible by setting the second spreading code.

The invention described in claim 3 is a direct sequence CDMA mobile communication system for
15 transmitting a signal after spreading the signal doubly with a first spreading code in a first spreading code group and a second spreading code in a second spreading code group, the first spreading code having the same repetition period as an
20 information symbol period, the second spreading code having a longer repetition period than the information symbol period, the first spreading code and the second spreading code forming spreading codes for enlarging a band of a wide-band signal, a
25 rate of the spreading codes being higher than an information rate, said system comprising:

a base station using the second spreading code assigned to each base station group or the second spreading code assigned to each network type
30 to which the base station group belongs; and

a mobile station communicating with the base station by using a signal which is spread by the second spreading code assigned to the base station.

35 According to the above-mentioned invention, the direct sequence CDMA mobile communication system which is suitable for the method described in claim

1 or 2 is provided.

The invention described in claim 4 is a transmitter in a direct sequence CDMA mobile communication system for transmitting a signal after
5 spreading the signal doubly with a first spreading code in a first spreading code group and a second spreading code in a second spreading code group, the first spreading code having the same repetition period as an information symbol period, the second
10 spreading code having a longer repetition period than the information symbol period, the first spreading code and the second spreading code forming spreading codes for enlarging a band of a wide-band signal, a rate of the spreading codes being higher
15 than an information rate,

the transmitter assigning a code being associated with each base station group or a code being associated with each network type to which the base station group belongs as the second spreading
20 code, and

the transmitter carrying out a communication using a signal spread by the second spreading code assigned to a base station.

The invention described in claim 5 is a
25 receiver in a direct sequence CDMA mobile communication system for transmitting a signal after spreading the signal doubly with a first spreading code in a first spreading code group and a second spreading code in a second spreading code group, the
30 first spreading code having the same repetition period as an information symbol period, the second spreading code having a longer repetition period than the information symbol period, the first spreading code and the second spreading code forming
35 spreading codes for enlarging a band of a wide-band signal, a rate of the spreading codes being higher than an information rate,

the receiver assigning a code associated with each base station group or a code associated with each network type to which the base station group belongs as the second spreading code, and

5 the receiver carrying out a communication using a signal spread by the second spreading code assigned to a base station.

The invention described in claim 6 is a transceiver in a direct sequence CDMA mobile
10 communication system for transmitting a signal after spreading the signal doubly with a first spreading code in a first spreading code group and a second spreading code in a second spreading code group, the first spreading code having the same repetition
15 period as an information symbol period, the second spreading code having a longer repetition period than the information symbol period, the first spreading code and the second spreading code forming spreading codes for enlarging a band of a wide-band
20 signal, a rate of the spreading codes being higher than an information rate,

the transceiver assigning a code associated with each base station group or a code associated with each network type to which the base
25 station group belongs as the second spreading code, and

the transceiver carrying out a communication using a signal spread by the second spreading code assigned to a base station.

30 According to the inventions described in claims 4 - 6, the transmitter, the receiver and the transceiver in a base station or a mobile terminal apparatus in the direct sequence CDMA mobile communication system which is suitable for the
35 method described in claim 1 or 2 are provided.

The invention described in claim 7 is the transmitter in the direct sequence CDMA mobile

communication system as claimed in claim 4, the transmitter comprising:

second spreading code control means which generates and controls the second spreading code associated with each base station group or each
5 network type to which the base station group belongs.

The invention described in claim 8 is the receiver in the direct sequence CDMA mobile communication system as claimed in claim 5, the
10 receiver comprising:

second spreading code control means which generates and controls the second spreading code associated with each base station group or each
15 network type to which the base station group belongs.

The invention described in claim 9 is the transceiver in the direct sequence CDMA mobile communication system as claimed in claim 6, the transceiver comprising:

second spreading code control means which generates and controls the second spreading code associated with each base station group or each
20 network type to which the base station group belongs.

In the inventions described in claims 7 - 9, the second spreading code control means is
25 provided for generating and controlling the second spreading code associated with each base station group or a network type to which the base station group belongs, in the transmitter, the receiver and the transceiver in a base station or a mobile
30 terminal apparatus in the direct sequence CDMA mobile communication system described in claims 4 - 6.

BRIEF DESCRIPTION OF THE DRAWINGS

35 Other objects, features and advantages of the present invention will be apparent by reading the following description in conjunction with the

accompanying drawings, in which

Fig.1 is a block diagram of an example of a direct sequence system which doubly spreads a signal of the prior art 1.

5 Fig.2 is a block diagram of another example of a direct sequence system which doubly spreads a signal of the prior art 2.

Fig.3 is a block diagram of a receiver of the prior art.

10 Fig.4 is a block diagram of a transmitter of the prior art.

Fig.5 is a diagram showing a roaming service between PBXs of the prior art.

15 Fig.6 is a diagram showing an example of a correspondence between base station group numbers and second spreading codes.

20 Fig.7 is a diagram showing an example of a correspondence between base station group numbers, network identifying numbers and second spreading codes.

Fig.8 is a diagram for explaining a system configuration example when assigning the second spreading code in connection with the base station group.

25 Fig.9 is a diagram for explaining a system configuration example when assigning the second spreading code in connection with a network type.

Fig.10 is a diagram for explaining a generation method of the second spreading code.

30

PREFERRED EMBODIMENTS FOR CARRYING OUT THE INVENTION

In the following, embodiments of the present invention will be described with reference to figures.

35 Fig.6 shows an example of a correspondence between base station group numbers and second spreading codes. Conventionally, the second

spreading code is assigned to each base station. On the other hand, in the example shown in Fig.6, the second spreading code is assigned to each base station group. A mobile communication system such as a cordless telephone system and the like can be taken as an example of the base station group. That is, when there are a plurality of cordless telephone systems in a house, the second spreading code is assigned to each cordless telephone system.

10 Therefore, in this case, cordless bases in the same cordless telephone system use the same second spreading code so as to second-spread a transmitting signal and send the signal to cordless handsets.

Fig.6 shows an example in which the second spreading codes are assigned to three cordless telephone systems. That is, a second spreading code 101010101010 is assigned to a cordless telephone system 1111, a second spreading code 010101010101 is assigned to a cordless telephone system 2222, a second spreading code 000000111111 is assigned to a cordless telephone system 3333.

15

20

In the embodiment of the present invention shown in Fig.6, the cordless base sends a signal after spreading the signal with a second spreading code assigned to a cordless telephone system to which the cordless base belongs. For example, with reference to Fig.1, a cordless base of the cordless telephone system having a system identifying number 1111 multiplies information received from the input terminal 1 by an output from the first spreading code generator 3 at the multiplier 2 so as to first-spread the information. Next, a spreading output from the multiplier 2 is second-spread by the multiplier 4 with a second spreading code

25

30

35 101010101010 associated with the system identifying number 1111 assigned to the cordless telephone system to which the cordless base belongs, and then

a spreading modulation signal output which should be transmitted to a cordless handset is obtained at the output terminal 6.

On the other hand, a cordless handset uses
5 a second spreading code assigned to a cordless telephone system to which the cordless handset belongs. For example, the cordless handset in the cordless telephone system having the system identifying number 1111 use the same second
10 spreading code 101010101010.

As mentioned-above, the cordless base and the cordless handset use the same second spreading code assigned to the cordless telephone system to which the cordless base and the cordless handset
15 belong. Thus, when a cordless base and a cordless handset belong to the same cordless telephone system, the second spreading code with which the cordless base spreads a signal and the second spreading code used by the cordless handset are the same.
20 Therefore, the cordless handset can receive a signal. Since a spreading code in itself functions as an identifying number of a cordless telephone system, the cordless handset does not need to check the identifying number of the cordless telephone system
25 after identifying a spreading code for despreading. Thus, the cordless handset can identify easily a cordless base with which the cordless handset can communicate.

In addition, the cordless handset can not
30 communicate with a cordless base of an other cordless telephone system. Therefore, interference from other cordless telephone systems can be avoided.

Fig.8 shows an example of a direct
sequence CDMA mobile communication system in the
35 above-mentioned case. The system includes a public network 51 and the like, control apparatuses 52₁ - 52_n and base station apparatuses 55 - 60. The base

station apparatuses 55 ... 56 form a base station group 1, the base station apparatuses 57 ... 58 form a base station group 2, and the base station apparatuses 59 ... 60 form a base station group n.

5 For example, a second spreading code 101010101010 (L1) is assigned to the base station group 1, a second spreading code 010101010101 (L2) is assigned to the base station group 2, and a second spreading code 000000111111 (L3) is assigned
10 to the base station group 3.

 A mobile terminal apparatus which has the second spreading code 101010101010 (L1) assigned to the base station group 1 can communicate with base station apparatuses in the base station group 1.
15 However, the mobile terminal apparatus can not communicate with a base station apparatus in another base station group (for example, a base station apparatus belonging to the base station group 2 or the base station group 3).

20 A mobile terminal apparatus having the second spreading codes 101010101010 (L1) and 010101010101 (L2) assigned to the base station group 1 and the base station group 2, respectively, can communicate with a base station apparatus in the
25 base station group 1 and a base station apparatus in the base station group 2.

 Fig.7 shows a method for assigning the second spreading code which method is different from that shown in Fig.6. In the example shown in Fig.6,
30 the second spreading code is assigned to each cordless telephone system. On the other hand, in the example shown in Fig.7, the second spreading code is assigned to a unit in which a plurality of cordless telephone systems exist. (The unit
35 including a plurality of systems is called "a network type". That is, each network type includes one or a plurality of systems.) In other words,

when there are a plurality of cordless telephone systems in a house, the second spreading code is assigned to each network type. Therefore, in this case, when cordless bases of different cordless
5 telephone systems belong to the same network type, the cordless bases can second-spread a signal with the same second spreading code and transmit the signal.

Fig.7 shows an example of a correspondence
10 between system identifying numbers, network identifying numbers and second spreading codes. The network identifying number is an identifying number assigned to each of the above-mentioned network types. Fig.7 shows an example in which second
15 spreading codes are assigned to three cordless telephone systems. Each cordless telephone system has a network identifying number associated the network type. A cordless telephone system 1111 and a cordless telephone system 2222 belong to the same
20 network type and have the same network identifying number 12345678. A cordless telephone system 3333 has a network identifying number 87654321.

In addition, the second spreading code is assigned in correspondence with the network
25 identifying number. A second spreading code 010101010101 is assigned to the network identifying number 12345678 and a second spreading code 000000111111 is assigned to the network identifying number 87654321.

In the embodiment shown in Fig.7, a
30 cordless base spreads a signal with a second spreading code assigned to a network identifying number of a cordless telephone system to which the cordless base belongs. For example, with reference
35 to Fig.1, a cordless base which has the system identifying number 1111 first-spreads information received from the input terminal 1 by multiplying

the information by an output from the first spreading code generator 3 at the multiplier 2. Next, the cordless base second-spreads the spreading output from the multiplier 2 at the multiplier 4 with a second spreading code 0101010101 associated with the network identifying number, and obtains a spreading modulation output at the output terminal 6.

When a cordless handset moves to a zone of another cordless telephone system, the cordless handset can continue to perform a communication if the other cordless telephone system has the same network identifying number as that of the cordless telephone system to which the cordless handset originally belongs.

For example, when a cordless handset in the cordless telephone system 1111 moves to a zone of the cordless telephone system 2222, the cordless handset can continue to perform a communication since the network identifying numbers are the same and the second spreading codes from cordless bases are the same. However, when a cordless handset in the cordless telephone system 1111 moves to a zone of the cordless telephone system 3333, the cordless handset can not continue to perform a communication since the second spreading codes from the cordless bases are different.

Thus, in the direct sequence CDMA cordless telephone system, a roaming service can be provided only by assigning the second spreading code associated with the network identifying number of a cordless telephone system to which a cordless base belongs.

Fig.9 shows an example of a direct sequence CDMA mobile communication system in the above-mentioned case. The system includes the public network 51 and the like, the control apparatuses 52₁ - 52_n and the base station

apparatuses 55 - 60. The base station apparatuses 55 ... 56 form a base station group 1, the base station apparatuses 57 ... 58 form a base station group 2, and the base station apparatuses 59 ... 60 form a base station group n. The control apparatuses are interconnected.

For example, a network type 123456 and a second spreading code L1 are assigned to the base station group 1, the network type 123456 and the second spreading code L1 are assigned to the base station group 2, and the network type 123456 and the second spreading code L1 are assigned to the base station group n.

A mobile terminal apparatus having the second spreading code L1 can communicate with a base station apparatus in a base station group which has the second spreading code L1 (for example, base station apparatuses 55 - 60 which belong to the base station group 1, the base station group 2 or the base station group 3).

The roaming service can also be provided in such a way that a cordless handset has a plurality of second spreading codes associated with cordless telephone systems which obtain the roaming service.

For example, if a cordless handset has a second spreading code of a network type 789012 other than that of the network type 123456, the cordless handset can communicate with a base station group which belongs to the network type 789012.

In addition, by assigning a code associated with each base station group or a code associated with each network type to which the base station group belongs as the second spreading code, various services can be provided by using the second spreading code.

For example, by verifying the second

spreading code between a base station and a mobile station, it becomes possible to restrict an originating call or an incoming call by geographic area.

5 In addition, by assigning a code associated with each base station group or a code associated with each network type to which the base station group belongs by carrier, geographic area, floor level of a building, company, special service
10 or the like, various services in a small area, a midsize area, a wide area, an indoor area, an outdoor area or the like becomes possible.

 A method for generating the second spreading code provided in a base station or a
15 mobile terminal apparatus will be described with reference to Fig.10. The base station or the mobile terminal apparatus includes an initializing means 70, a storing means 71, a second spreading code generation control means 72 and a second spreading
20 code generation means 73.

 When the second spreading code is generated, first, a base station group number and a network identifying number to which the base station or the mobile terminal apparatus belongs are
25 registered (70). Then, the registered base station group number and the network identifying number are stored in the storing means 71. The second spreading code generation control means 72 extracts parameters about a generating polynomial, an initial
30 value and a phase according to the stored base station group number and the network identifying number which was stored in the storing means 71. The second spreading code generation means 73 generates a second spreading code (for example, a PN
35 code) on the basis of the parameters about the generating polynomial, the initial value and the phase which were extracted in the second spreading

code generation control means 72.

Various systems including a sector system
can be adopted as a zone configuration of the
present invention. In addition, frequencies of an
5 up link and a down link are not necessarily the same
but may be different.

The present invention is not limited to
the specifically disclosed embodiments, and
variations and modifications may be made without
10 departing from the scope of the invention.

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CLAIMS

1. A spreading code assigning method in a direct sequence CDMA mobile communication system for transmitting a signal after spreading said signal
5 doubly with a first spreading code in a first spreading code group and a second spreading code in a second spreading code group, said first spreading code having the same repetition period as an information symbol period, said second spreading
10 code having a longer repetition period than the information symbol period, said first spreading code and said second spreading code forming spreading codes for enlarging a band of a wide-band signal, a rate of said spreading codes being higher than an
15 information rate, said method comprising the step of:

assigning a code associated with each base station group or a code associated with each network type to which said base station group belongs as
20 said second spreading code.

2. A signal transmitting method in a direct sequence CDMA mobile communication system for transmitting a signal after spreading said signal doubly with a first spreading code in a first
25 spreading code group and a second spreading code in a second spreading code group, said first spreading code having the same repetition period as an information symbol period, said second spreading code having a longer repetition period than the
30 information symbol period, said first spreading code and said second spreading code forming spreading codes for enlarging a band of a wide-band signal, a rate of said spreading codes being higher than an information rate, said method comprising the steps
35 of:

assigning a code associated with each base station group or a code associated with each network

type to which said base station group belongs as said second spreading code; and

transmitting a signal which is spread with said second spreading code between a base station
5 and a mobile station.

3. A direct sequence CDMA mobile communication system for transmitting a signal after spreading said signal doubly with a first spreading code in a first spreading code group and a second
10 spreading code in a second spreading code group, said first spreading code having the same repetition period as an information symbol period, said second spreading code having a longer repetition period than the information symbol period, said first
15 spreading code and said second spreading code forming spreading codes for enlarging a band of a wide-band signal, a rate of said spreading codes being higher than an information rate, said system comprising:

20 a base station using said second spreading code assigned to each base station group or said second spreading code assigned to each network type to which said base station group belongs; and

a mobile station communicating with said
25 base station by using a signal which is spread by said second spreading code assigned to said base station.

4. A transmitter in a direct sequence CDMA mobile communication system for transmitting a
30 signal after spreading said signal doubly with a first spreading code in a first spreading code group and a second spreading code in a second spreading code group, said first spreading code having the same repetition period as an information symbol
35 period, said second spreading code having a longer repetition period than the information symbol period, said first spreading code and said second spreading

code forming spreading codes for enlarging a band of a wide-band signal, a rate of said spreading codes being higher than an information rate,

5 said transmitter assigning a code associated with each base station group or a code associated with each network type to which said base station group belongs as said second spreading code, and

10 said transmitter carrying out a communication using a signal spread by said second spreading code assigned to a base station.

5. A receiver in a direct sequence CDMA mobile communication system for transmitting a signal after spreading said signal doubly with a
15 first spreading code in a first spreading code group and a second spreading code in a second spreading code group, said first spreading code having the same repetition period as an information symbol period, said second spreading code having a longer
20 repetition period than the information symbol period, said first spreading code and said second spreading code forming spreading codes for enlarging a band of a wide-band signal, a rate of said spreading codes being higher than an information rate,

25 said receiver assigning a code associated with each base station group or a code associated with each network type to which said base station group belongs as said second spreading code, and

30 said receiver carrying out a communication using a signal spread by said second spreading code assigned to a base station.

6. A transceiver in a direct sequence CDMA mobile communication system for transmitting a signal after spreading said signal doubly with a
35 first spreading code in a first spreading code group and a second spreading code in a second spreading code group, said first spreading code having the

same repetition period as an information symbol period, said second spreading code having a longer repetition period than the information symbol period, said first spreading code and said second spreading code forming spreading codes for enlarging a band of a wide-band signal, a rate of said spreading codes being higher than an information rate,

5 said transceiver assigning a code associated with each base station group or a code associated with each network type to which said base station group belongs as said second spreading code, and

said transceiver carrying out a communication using a signal spread by said second spreading code assigned to a base station.

7. The transmitter in the direct sequence CDMA mobile communication system as claimed in claim 4, said transmitter comprising:

second spreading code control means which generates and controls said second spreading code associated with each base station group or each network type to which said base station group belongs.

8. The receiver in the direct sequence CDMA mobile communication system as claimed in claim 5, said receiver comprising:

second spreading code control means which generates and controls said second spreading code associated with each base station group or each network type to which said base station group belongs.

9. The transceiver in the direct sequence CDMA mobile communication system as claimed in claim 6, said transceiver comprising:

second spreading code control means which generates and controls said second spreading code associated with each base station group or each

network type to which said base station group
belongs.

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ABSTRACT

The present invention relates to a spreading signal assigning method and a signal
5 transmitting method in a direct sequence CDMA mobile communication system, a mobile wireless communication system using the methods, and a transmitter, a receiver and a transceiver in the mobile wireless communication system in which an
10 assignment method of a second spreading code is devised such that various services can be provided. The invention is configured such that a signal spread with the second spreading code is transmitted between a base station and a mobile station by
15 assigning a code associated with each base station group or a code associated with each network type to which the base station group belongs as the second spreading code.

FIG. 1

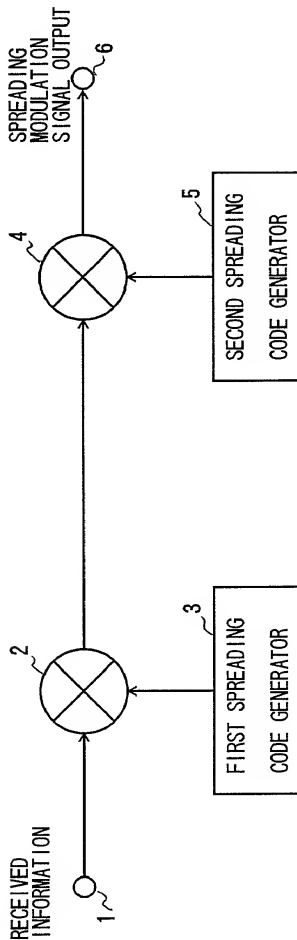


FIG. 2

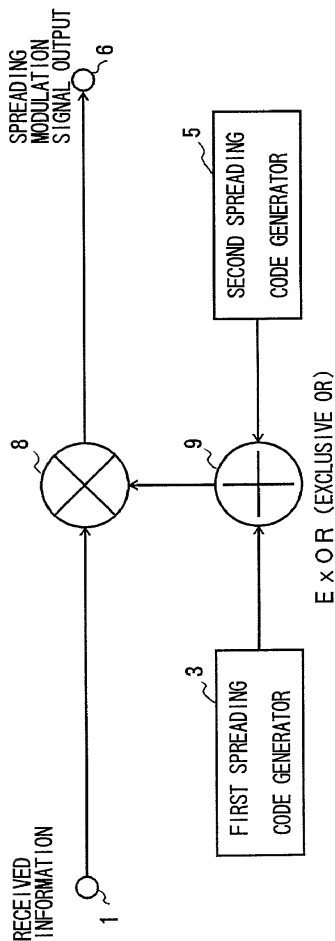


FIG. 3

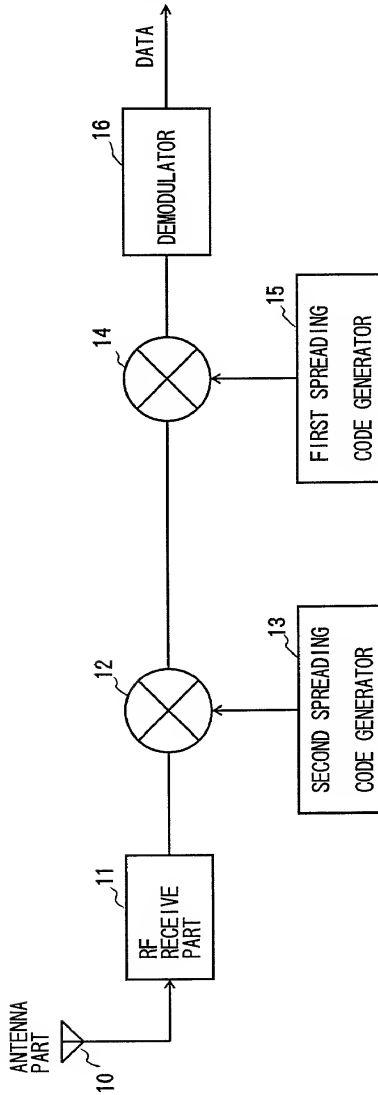


FIG. 4

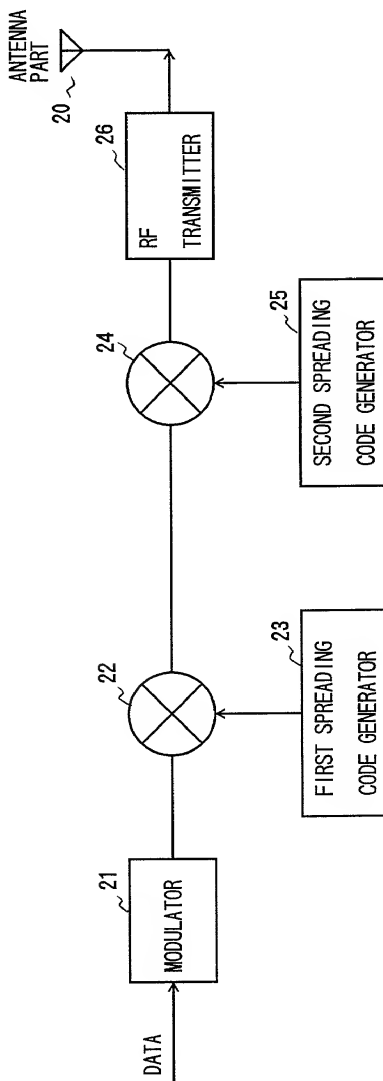


FIG. 5

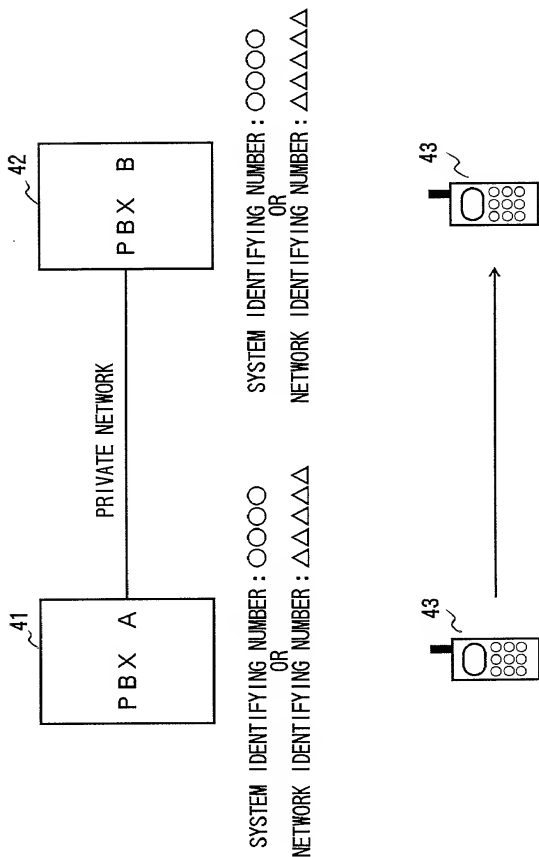


FIG. 6

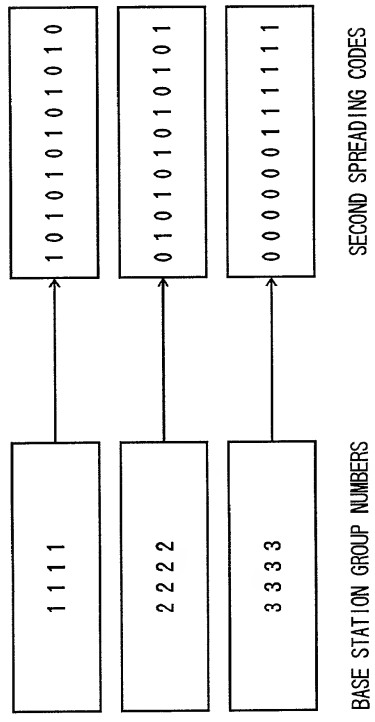


FIG. 7

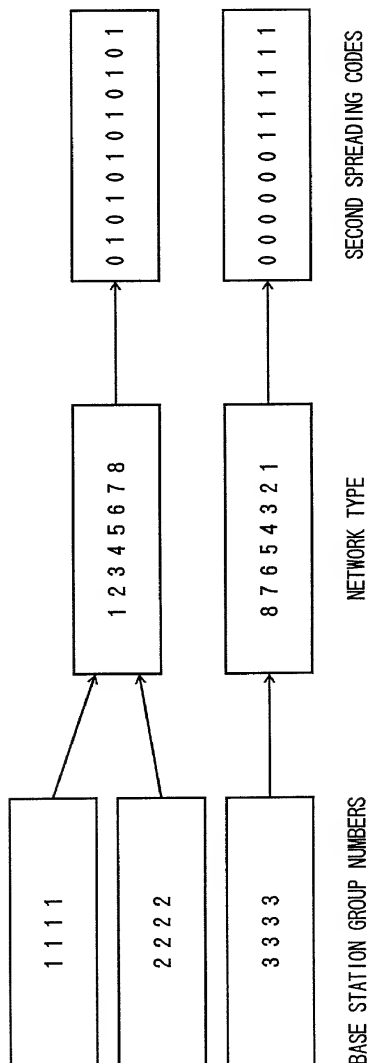
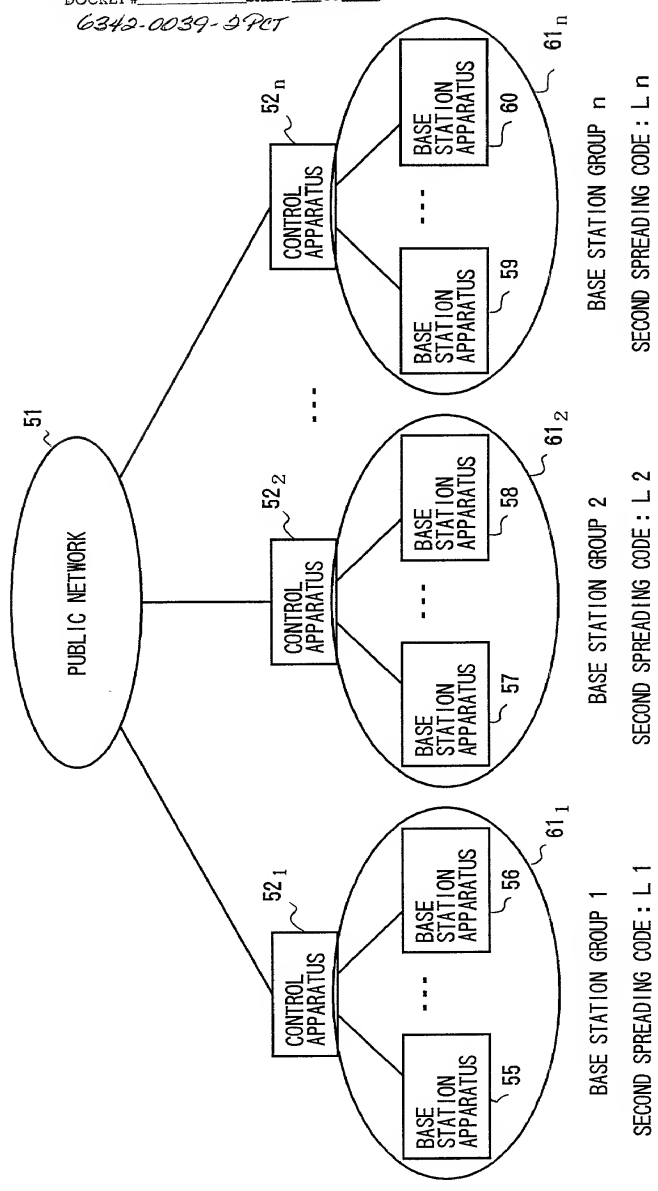


FIG. 8



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FIG. 9

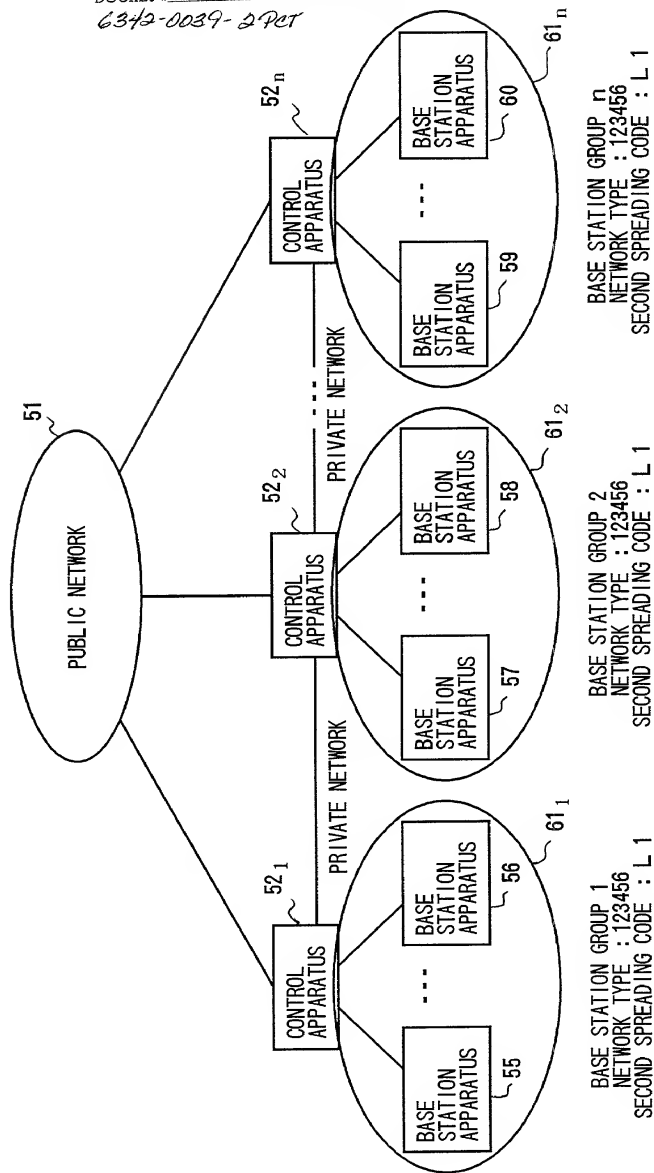
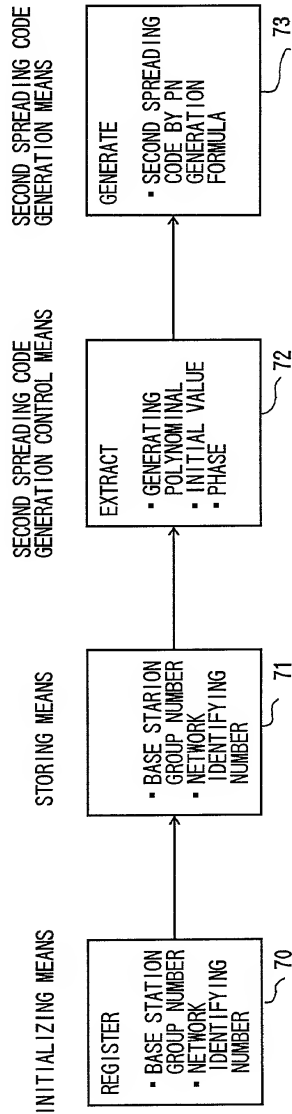


FIG. 10



Declaration and Power of Attorney For Patent Application

特許出願宣言書及び委任状

Japanese Language Declaration

日本語宣言書

下記の氏名の発明者として、私は以下の通り宣言します。

As a below named inventor, I hereby declare that:

私の住所、私書箱、国籍は下記の私の氏名の後に記載された通りです。

My residence, post office address and citizenship are as stated next to my name.

下記の名称の発明に関して請求範囲に記載され、特許出願している発明内容について、私が最初かつ唯一の発明者（下記の氏名が一つの場合）もしくは最初かつ共同発明者（下記の名称が複数の場合）であると信じています。

I believe I am the original, first and sole inventor (if only one name is listed below) or an original, first and joint inventor (if plural names are listed below) of the subject matter which is claimed and for which a patent is sought on the invention entitled. SPREADING SIGNAL ASSIGNING METHOD AND SIGNAL TRANSMITTING METHOD IN DIRECT

SEQUENCE CDMA MOBILE COMMUNICATION SYSTEM, MOBILE WIRELESS COMMUNICATION SYSTEM USING THE METHODS, AND TRANSMITTER, RECEIVER AND TRANSCEIVER IN THE MOBILE WIRELESS COMMUNICATION SYSTEM
the specification of which

☐ is attached hereto.

☒ was filed on May 7, 1999

as United States Application Number or

PCT International Application Number

PCT/JP99/02370 and was amended on

 (if applicable).

上記発明の明細書は、

☐ 本書に添付されています。

☒ 月 日に提出され、米国出願番号または特許協定条

約国際出願番号を とし、

(該当する場合) に訂正されました。

私は、特許請求範囲を含む上記訂正後の明細書を検討し、内容を理解していることをここに表明します。

I hereby state that I have reviewed and understand the contents of the above identified specification, including the claims, as amended by any amendment referred to above.

私は、連邦規則法典第37編第1条56項に定義されるとおり、特許資格の有無について重要な情報を開示する義務があることを認めます。

I acknowledge the duty to disclose information which is material to patentability as defined in Title 37, Code of Federal Regulations, Section 1.56.

Japanese Language Declaration
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私は、米国法典第35編119条 (a) - (d) 項又は365条 (b) 項に基づき下記の、米国外の国の少なくとも一カ国を指定している特許協力条約365 (a) 項に基づく国際出願、又は外国での特許出願もしくは発明者証の出願についての外国優先権をここに主張するとともに、優先権を主張している、本出願の前に出願された特許または発明者証の外国出願を以下に、枠内をマークすることで、示しています。

Prior Foreign Application(s)

外国での先行出願

Pat. Appln. No.10-124748

Japan

(Number)
(番号)

(Country)
(国名)

(Number)
(番号)

(Country)
(国名)

I hereby claim foreign priority under Title 35, United States Code, Section 119 (a)-(d) or 365(b) of any foreign application(s) for patent or inventor's certificate, or Section 365(a) of any PCT International application which designated at least one country other than the United States, listed below and have also identified below, by checking the box, any foreign application for patent or inventor's certificate, or PCT International application having a filing date before that of the application on which priority is claimed.

Priority Claimed
優先権主張

07/May/1998

(Day/Month/Year Filed)
(出願年月日)

☒ ☐
Yes No
はい いいえ

(Day/Month/Year Filed)
(出願年月日)

☐ ☐
Yes No
はい いいえ

私は、第35編米国法典119条 (e) 項に基づいて下記の米国特許出願規定に記載された権利をここに主張いたします。

(Application No.)
(出願番号)

(Filing Date)
(出願日)

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(Application No.)
(出願番号)

(Filing Date)
(出願日)

(Application No.)
(出願番号)

(Filing Date)
(出願日)

私は、私自信の知識に基づいて本宣言書中で私が行なう表明が真実であり、かつ私の入手した情報と私の信じることに基づく表明が全て真実であると信じていること、さらに故意になされた虚偽の表明及びそれと同等の行為は米国法典第18編第1001条に基づき、罰金または拘禁、もしくはその両方により処罰されること、そしてそのような故意による虚偽の声明を行なえば、出願した、又は既に許可された特許の有効性が失われることを認識し、よってここに上記のごとく宣誓を致します。

I hereby claim the benefit under Title 35, United States Code, Section 119(e) of any United States provisional application(s) listed below.

(Application No.)
(出願番号)

(Filing Date)
(出願日)

I hereby claim the benefit under Title 35, United States Code, Section 120 of any United States application(s), or Section 365(c) of any PCT International application designating the United States, listed below and, insofar as the subject matter of each of the claims of this application is not disclosed in the prior United States or PCT International application in the manner provided by the first paragraph of Title 35, United States Code Section 112, I acknowledge the duty to disclose information which is material to patentability as defined in Title 37, Code of Federal Regulations, Section 1.56 which became available between the filing date of the prior application and the national or PCT International filing date of application.

(Status: Patented, Pending, Abandoned)
(現況: 特許許可済、係属中、放棄済)

(Status: Patented, Pending, Abandoned)
(現況: 特許許可済、係属中、放棄済)

I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code and that such willful false statements may jeopardize the validity of the application or any patent issued thereon.

Japanese Language Declaration
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委任状：私は下記の発明者として、本出願に関する一切の手続きを米特許商標局に対して遂行する弁理士または代理人として、下記の者を指名いたします。
(弁護士、または代理人の指名及び登録番号を明記のこと)

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Japanese Language Declaration

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郵便の宛先		Post Office Address

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国籍		Citizenship
郵便の宛先		Post Office Address

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(Supply similar information and signature for third and subsequent joint inventors.)